SPECIAL MEETING.

Seventh Session, 30th May, 10 o'clock, A. M.

Dr. Patterson, Vice-President, in the Chair.

A letter was read from Captain Ericsson, dated New York, 27th May, on the subject of the Centennial Celebration.

Professor Kendall read a communication, entitled, "On the Instruments of the Astronomical Observatory of the United States' Military Academy, West Point,—and on the Observations made upon the Comet of February, 1843,—by Prof. William H. C. Bartlett, of the U. S. Military Academy."

The first part of this paper gives an account of the new building erected for the accommodation of the library and philosophical apparatus of the Military Academy. It is built principally of granite, and stands at the S. E. angle of the plain, about 160 feet above the level of the river; having an uninterrupted view to the south of about eight miles, and to the north of about four miles. The main cell is one hundred and twenty feet long, and sixty feet broad. It is divided into two equal parts by a partition wall. The western division, with the tower, being appropriated to Natural and Experimental Philosophy, for purposes of instruction; and the eastern division, which is in one entire room, to the library. The astronomical instruments are in three towers, prepared expressly for them. Within these towers are masses of masonry, which rise from a bed of coarse gravel, twelve feet below the natural surface of the ground, to a height necessary to free the view from all obstructions. These columns are perfectly insulated from the foundation to the top, where the instruments rest. Immediately to the south of the central tower, is a fourth insulated column, extending nearly to the ridge of the roof, with no covering: this is intended for observations with the portable instruments. The central tower is surmounted by a revolving dome, twenty-seven feet in horizontal diameter, and about seventeen feet high from the springs. It has five window openings near the curb, and an observing slit, two feet wide, extending from a point forty-eight inches above the floor, to nearly two feet on the opposite side of the zenith: this has a range of shutters which are worked by levers, independently of each other.

The whole dome rests on six twenty-four pound cannon balls, which turn between two cast iron annular grooves. The dome is moved by means of a rack, attached to its base, and a stationary pinion, which is turned by a hand wheel, seven feet in diameter. The flank towers are furnished with meridian observing slits, about twenty inches in the clear, which afford an uninterrupted view of the celestial meridian.

The building itself, which is of the Elizabethan style of Gothic architecture, was designed by Major Delafield, the superintendent of the institution.

The second part contains a minute description of the equatorial, the only fixed instrument now in place. It is by Mr. Thomas Grubb of Dublin. Mr. Grubb's mounting resembles in principle that of Fraünhofer, though in the arrangement of its parts it is quite different.

The method pursued, and the formulæ used in adjusting the instrument, are given at length by Prof. B.; as also the mode of obtaining the value of a micrometer revolution.

The last part of the paper contains the results of the observations made on the comet of 1843, at West Point. Owing to unfavourable weather, the comet was observed only on the 24th, 25th and 29th of March, and 2d of April.

The method pursued in making these observations was as follows: The difference of the instrumental places of two bodies, corrected for the change of instrumental errors arising from a change of position, being equal to the difference of their true places; if some well known star be observed the same evening with the comet, the true place of the latter becomes known. To keep the instrument as nearly as possible in the same bearings during the observations on both bodies, α Ceti was selected, and used throughout. To correct these observations for the change of instrumental errors, the following formulæ of Kreil, Mem. Astr. Soc., Vol. IV. p. 495, were used; they were also used in making the adjustments of the equatorial.

$$S = \sigma + \Delta\sigma + \lambda \operatorname{Sin.} (\phi - S) \tan. \delta + \mu \tan. \delta + \nu \sec. \delta$$
$$P = \pi + \Delta\pi + \lambda \cos. (\phi - S)$$

In which S is the true, and σ the instrumental hour angle, corrected for refraction; P the true, and π the instrumental polar distance, corrected for refraction; $\Delta\sigma$ and $\Delta\pi$ the index errors of the hour and declination circles respectively; λ the distance in arc between the pole of the heavens and that of the instrument; φ the hour angle of the instrumental pole, estimated from the meridian to the west; μ the difference between 90° and the angle which the declination axis makes with the polar; ν the difference between 90° and the angle which the line of collimation makes with the declination axis; and δ the declination of the body.

In this way the following places were obtained for the comet:—

		h m s		° ′ ″	
March 25th,	Right Ascension,	3 35 20.14	Dec.	— 7 48 46.6	$= \delta$
29th,	do.	3 55 05.8	„	— 6 48 58.	= „
April 2d,	do.	4 11 51.95	„	— 5 58 43.1	= „

which being converted into longitudes and latitudes, and cleared from the effects of aberration by the usual formulæ for a fixed star, gave,—

		° ′ ″		° ′ ″
March 25th,	Longitude,	49 17 52	Latitude,	— 26 18 11
29th,	„	54 52 35	„	— 26 32 35
April 2d,	„	59 37 38	„	— 26 37 42

The portion of the aberration due to the proper motion of the comet, was applied to the time, according to the method of Mr. Gauss. The correction in the place of the earth for the effect of parallax, was disregarded in consequence of its small value, the first curtate distance being greater than unity.

The method by which the following elements were computed was that of Dr. Olbers, as given by Dr. Bowditch in the appendix to his Commentary on the *Mécanique Celeste.*

Longitude of the ascending node, - -	357° 41′ 49″
Inclination, - - - - -	36 41 48
Long. perihelion, - - - -	261 31 47
Perihelion distance, - - - -	0.053774
Perihelion passage, Greenwich mean time, Feb. 26th, motion retrograde, - - - -	6018
Distance from the earth on the evening of 29th of March, - - - -	107,002,000 miles.
Approximate diameter of the nebulous envelope,	36,800 „

The Communication of Professor Bartlett was accompanied by plans, elevations, and sectional views of the building for the Library and Philosophical Apparatus, prepared by Lieutenants Richard Smith and Eaton, and by drawings of many of the instruments described.

Mr. Richard C. Taylor presented and read a memoir "On the Geology of the North-east Part of the Island of Cuba, and on the Character and Prospects of the Copper Region of Gibara."

The earlier part of Mr. Taylor's paper is given to a description of the various rocks, found in the north-eastern parts of Cuba. These are principally magnesian, though there are also some of the calcareous class, which are highly interesting. They are all in a greater or less degree metamorphic, and occupy a highly inclined position.

Two principal and two subordinate parallel chains of white modified limestone, range across this part of the island in an E. N. E. direction. All these calcareous mountains are isolated, picturesque, and of singular form, as if thrust up from the midst of the serpentines, and greenstones, and diallage, which surround their bases.

An important geological feature of this country consists in a well defined anticlinal axis, of which the most northern chain of limestone mountains is the centre, and which pursues the E. N. E. direction alluded to. This axis tilts off the entire series of stratified rocks on either side: those on the north descending in that direction at an average angle of about forty-five degrees, and those on the south side of the axis dipping southward towards the interior, at an average angle of sixty-five degrees. Mr. Taylor remarked that the longitudinal extent of this axis was not ascertained with certainty; but that it was at least coextensive with the utmost limits of his observation, which embraced forty miles. He is inclined to the opinion, that the area which lies north of the anticlinal axis, and forms a belt eight or ten miles wide bordered by the sea, has undergone a greater metamorphic change than the area which stretches to the southward. In both instances it seems to be certain, that the igneous changes and the local disturbances of strata were greatest in the parts which are nearest to the centre of the axis.

The author next describes the prevailing geological character of the savanna or mineral region of Gibara. He details some peculiarities of the limestone mountains; their remarkable outline as seen from the sea; their peculiar precipitous sides and columnar appearance when viewed at a shorter distance on the land.

A description follows of the mountain of La Silla, and the peculiarities attending its caves; and of the novel appearance there, and at various elevations on the mountain to within fifteen feet of its highest crest, of a compact calcareous formation crowded with shells, which on investigation prove to be those of the land. This new geological formation, at first so inexplicable, is traced to the enormous accumulation of land shells, in a dead state, in the caves and fissures and recesses of the mountain; their envelopment, mingled with other animal exuviæ and the dung of myriads of bats; and their subsequent consolidation by means of the filtration and crystallization of carbonate of lime: thus, in the progress of time, by this stalagmitical process, some of these caverns have been filled with solid matter.

Another yet more interesting fact presented itself. Among these partially fossilized land shells, were perceived other testacea that were unquestionably marine. The difficulty of accounting for this latter fact was removed by degrees, on witnessing the transporting agents then in operation. These are neither more nor less than the soldier crabs, [*Pagurus*,] which, at certain seasons, repair to the sea coast from the interior, to seek the dead littoral shells, and to appropriate them as habitations. Loaded with these they climb up the steepest mountains and traverse the densest woods. In such situations one continually perceives marine univalves, many miles in the interior, to which they have been carried by these persevering appropriators. As the caves form the retreat of a variety of animals, who in dying leave their bones upon the floors, these also become incorporated with the testacea of the land and the ocean; all contributing towards the construction of a new rock,—a geological puzzle which at some future day may furnish abundant matter for the disquisitions of the learned.

After describing the ancient and existing coral reefs that border the island, the author proceeds to the history of the discovery of copper lodes in the mineral region of Gibara; a brief account of the works that have been commenced there; and a few details and analyses of the ores. The paper terminates with notices of the deposites of chrome ore, and of the auriferous beds near Holguin.

Professor Booth read a Communication by James P. Espy, Esq., "On the Law of Cooling of Atmospheric Air for various suddenly diminished Pressures."

If clouds are formed from the cold of diminished pressure in upmoving columns of air, as Mr. Espy has contended in his "Philosophy of Storms;" and if it be true, as he assumes, that all the phenomena of storms are dependent on the latent caloric of vapour or steam which is condensed in the storms themselves; it becomes important to ascertain accurately what degree of cold is produced in air by the sudden diminution of pressure.

This Mr. E. has attempted to do by experiments with his Nephelescope,—an instrument, consisting of an iron flask, such as is used for holding mercury, with a stop-cock attached, an exhausting pump, and a bent-tube barometer gauge. The results are arranged in tabular form at the end of his paper: the mode of attaining and applying these, he illustrates by reference to the first experiment of the table.

Having pumped out air from the flask, till the mercury in the inner leg of the gauge stood at 48 quarter inches higher than in the outer, and waited till the air within had acquired the temperature of that without, 66°, he opened the stop-cock so as to admit air freely, and closed it again at the moment of equilibrium of pressure. The condensation thus produced within the flask raised the temperature above that of the room; and the cock remaining closed, the mercury gradually rose as the air cooled within, till it rested at 6 quarters of an inch higher in the inner leg than in the outer.

Applying to this experiment the law, that air at the temperature t° will expand to double the volume if heated $448^\circ + t^\circ$, Mr. Espy determines that all the air in the flask at the end of the experiment was heated 25°.7; and by reference to the proportion between the air which entered to produce the condensation and that which was condensed, he concludes, that the condensed air alone would have been heated 40°.7 nearly, but for its intermixture with the other. Remarking however, that a much greater degree of heat is developed by condensing air into one-half than is absorbed by expanding it to double its volume, he ascertains by computation that air of the temperature of 66° is reduced 38°.6 by a sudden change from a pressure of 30 inches of mercury to that of 30 — 12, or 18 inches.

In the same manner, taking the mean of the experiments, Nos. 7, 12, 15, 17, and 19, he finds that with the air at 66°, a sudden change in the pressure from 29.92 inches of mercury to 13.10 inches, effects a reduction of temperature of 57°: and from experiments Nos. 8, 9, 10, 11, 16, 18, and 21, that air of the same temperature would be reduced 85° by a change of pressure from 29.91 to 9.91 inches.

Mr. Espy has observed, that when the air has been reduced but little in density, the effect on the temperature as ascertained by experiment is greater than that indicated by calculation; and that where the reduction of density has been greater, the result is otherwise. We may safely say, he remarks, that where the rarefaction is not pushed above two-thirds, the cooling effect is not greater than the proportion given above;—a conclusion which has a most favourable bearing on the theory of storms presented in his work on that subject. The paper closes with a brief outline of his theory, and the following table:—

Experiments with the Nephelescope on Air under diminished Pressure.

Number.	Date. May, 1843.	Barometer.	Thermometer.	Difference of pressure before opening, in quarter inches.	Difference of pressure after opening, in quarter inches.
1	13	30.00	66°	48	6.
2	13	30.00	66°	51.5	5.5
3	13	30.00	66°	47	5.5
4	13	30.00	66°	76	1.25
5	13	29.90	68	53.5	6.
6	13	29.90	69	60.5	6.5
7	13	29.90	69	67.75	6.5
8	13	29.90	69.5	72.5	7.
9	13	29.90	70	75	6.6
10	13	29.90	70	78.5	7.
11	13	29.90	70	84.5	7.25
12	14	30.00	67	67.5	6.5
13	14	30.00	68	70.4	6.5
14	14	30.00	70	26	3.6
15	14	29.90	70	65.5	6.5
16	14	29.90	70	81	7.65
17	14	29.90	70	66.3	6.4
18	16	29.99	76.5	88	7.3
19	16	29.99	77	69	6.5
20	16	29.97	78	71	6.75
21	16	29.97	78	80	7.
22	18	30.24	64	23.5	3.3
23	21	29.72	66	93	7.

From these experiments it appears also, says Mr. E., that the greatest rise of the mercury after condensation never amounts to eight quarters of an inch; and that the maximum rise occurs nearly when the density of the air within the nephelescope is reduced to about one-third: in experiment 23d, where the exhaustion was pushed the furthest, the rise after condensation was only seven quarters.

Professor Ducatel, of Baltimore, communicated a paper embracing a general view of the physical geography and geology of the State of Maryland, in connexion principally with its agricultural condition and resources, being one chapter of the work entitled, "Physical History of the State of Maryland," now in progress of publication by himself and John H. Alexander, Esq., C. E.

In this communication, the varied aspect of the State of Maryland, presented by the magnificent Chesapeake Bay, with its numerous arms reaching to the inmost portions of the eastern division of the State, which comprises two-thirds of its territory; the table lands that cover the region of primary rocks and afford a great variety of good soils; the mountain ridges and intervening fertile valleys; the great susceptibilities of the soils in all parts of the State to improvement; and the abundant natural resources that every where present themselves, are dwelt upon in refutation of the allegation so generally made in popular works on geography, of the comparative insignificance of Maryland as a productive member of the great confederacy. The *eastern shore* is shown to consist of something more than arid sand-hills and pestilential marshes; and the *western shore* not to depend exclusively upon the rich valleys of Frederick and Hagerstown for its supplies. The region of country so amply provided with mineral wealth, in the way of coal and iron ores, is shown to possess also a very productive soil, and an amount of water-power capable of putting into activity a most extensive industry, and of sustaining a numerous population. The agricultural and mineral resources of the State are supposed by the authors to be equal, if not to surpass, those of any other portion of the United States' territory of the same extent. The communication likewise exhibits the most prominent features in the Sylva, Flora, and Fauna of the State.

A Communication, entitled, "Notice of the Meteorological Observations now making at the Military Posts of the U. S., by G. Mower, M.D., Surgeon U. S. A.," was read by Dr. Emerson; who prefaced it by some remarks on the present system of simultaneous observations, and on the state of Meteorological Science in the United States.

This paper, which was communicated on behalf of the Medical Department of the Army, presents a narrative of the operations of that department in collecting meteorological data, and solicits the coöperation of scientific men throughout the country.

Previous to the year 1818, we possess no records of meteorological observations taken in the United States on an extensive scale. During that year the surgeons at the military posts were directed to keep regular records of the weather, and transmit them quarterly to the Medical Bureau at Washington. The earliest registers, thus transmitted, and on file in the Surgeon General's Office, are dated January, 1819.

The merit of introducing meteorological observations into the army is due to the late surgeon general, Dr. Joseph Lovell. The instruments at first were only however the thermometer and vane, to which the rain gauge was added in 1836. The results of these observations, from 1820 to 1830 inclusive, have been already published, and it is the purpose of the Department to complete the series to the present time.

As points of observations for the study of climate, our military posts possess peculiar advantages. They extend from the twenty-fifth to the forty-sixth degree of latitude, and from the sixty-seventh to the ninety-sixth degree of longitude; an immense region, embracing the whole inhabited area of the United States. A large proportion of them stand at intervals along two nearly parallel lines, running from south to north, and forming our eastern and western frontiers; extending on the Atlantic from Key West, near the Bahamas, to Passamaquoddy bay; and on the west, from the Balize to the Falls of St. Anthony. From this disposition of our posts, it happens that almost every parallel of latitude intersecting our country passes through a military station. And as the mean annual temperature of these posts has been determined by a series of observations, extending from ten to twenty years, we have been enabled to draw isothermal lines, coinciding at one or more points with almost every parallel of latitude, between Cape Sable and the St. Lawrence.

The United States, forming a zone of about twenty degrees of latitude, exhibit a range of mean annual temperature of 32°, which is equal to the range between Stockholm and Grand Cairo, a zone of 29°. The isothermal lines which intersect the capitals of Sweden and of Egypt, pass near Fort Brady, Mich., and St. Augustine, Fa., at a distance of only about 16°.

On passing the 30th degree of latitude, the climate of America is colder than that of Europe in the same parallels; and the difference increases in our progress from south to north. Thus Fort Monroe, Va., has the same mean temperature as Naples, 3½° farther north; Washington, as Nantes, 8½° farther north; Fort Wolcott, Newport, R. I., as London, 10° farther north; Fort Preble, Portland, Maine, as Edinburgh, 12° farther north; and Fort Sullivan, Eastport, Maine, as Stockholm, 15° farther north.

Since the beginning of the present year, the observations have been conducted on a larger scale, under instructions, matured by a board of which the author was a member, and subsequently approved by the present surgeon general, Dr. Lawson, and by the Secretary of War. Observations are now taken with the thermometer, the barometer and attached thermometer, and on the wind, the clouds, the clearness of the sky, and the dew-point by the wet bulb thermometer. These observations are recorded at four different periods of the day, except those with the wet bulb, which are taken only twice. The time when rain began and ended, and the quantity which fell, are noted at the close of every shower. In addition, the medical officers are requested to note under the head of "Remarks," all remarkable phenomena, especially sudden and simultaneous changes of wind and temperature; their effect on the barometer; the moment of greatest depression of the barometer in the passage of storms; the time of clouding; currents of clouds moving in different directions, and at different heights; the rise and fall of rivers and lakes; remarkable tides; the opening and closing of navigable waters; the last killing frost that occurs in spring, and the first in autumn, as shown by their effects on the tender buds, leaves, and germs of fruit trees, &c.; the commencement and progress of vegetation; the first appearance and departure of birds of passage; thunder storms, near or remote; silent lightning, with its direction and elevation above the horizon; falls of hail, snow, and sleet; fogs; white or hoar frost, &c.; also to examine the heavens at the latest hour of observation, whether there be any aurora, or shooting stars; and, especially about the 10th of August, and 12th and 13th of November, to see whether there be any great number of luminous meteors visible, stating the number observed in an hour, or at least in a quarter of an hour; and further, in cases of great fires occurring in clear, calm, dry weather, with a high dew-point, to observe whether clouds form over the fire, and to describe the phenomena.

At the equinoxes and solstices, *hourly* observations of the barometer are directed to be taken for twenty-four hours, to correspond with those already instituted at numerous points of Europe and America, at the suggestion of Sir John Herschel. The days fixed upon for these observations are the 21st of March, June, September, and December. But should any one of these 21st days fall on Sunday, then the observations will be deferred till the 22d. The observations at each station will commence at 6 o'clock A.M., and be continued at the beginning of each hour till 6 o'clock A.M. of the following days, care being taken to obtain the correct time.

The periods recommended for meteorological hours by the Royal Society of London, are 3 and 9 A.M., and 3 and 9 P.M. These periods the Department have adopted, with the substitution of sunrise for 3 A.M., as being more seasonable, and better suited to the routine of military service. The maxima and minima of the barometric oscillations, at the level of the sea, probably occur at these hours over a large portion of the globe. Besides, the lowest degree of temperature and dew-point are obtained, as experience has shown, shortly before the dawning of day, and the highest degree nearly at 3 P.M. The pair of hours, 9 A.M. and 9 P.M. coincide nearly, not only with the maxima of atmospheric pressure, but with the periods of mean morning and evening temperature; and half the sum of these two observations will be a near equivalent for the mean daily temperature, as is shown by Captain Mordecai of the corps of engineers, in his observations at Frankford Arsenal, near Philadelphia.

Observations are now made at sixty military stations, which with few exceptions are situated either on our maritime or inland frontier. The following list will give their distribution through the different states and territories: 5 in Maine, 1 in each of the states of New Hampshire, Massachusetts, Rhode Island, and Connecticut, 9 in New York, 4 in Pennsylvania, 2 in Maryland, 1 in Virginia, 2 in North Carolina, 1 in South Carolina, 2 in Georgia, 4 in Florida, 2 in Alabama, 5 in Louisiana, 3 in Arkansas, 1 in Arkansas Territory, 3 in Missouri, 1 in Missouri Territory, 4 in Iowa, 2 in Wisconsin, and 5 in Michigan.

But, the author remarks, while from the position of our posts the points of observation are thus extended along the frontier, the interior of our land is left comparatively destitute. On the Atlantic slope only two barometers are placed at any considerable distance from the ocean, at Carlisle Barracks, Pa., and Augusta Arsenal, Geo.: and there is not a single point of observation in the large tract of territory, embracing the states of Ohio, Indiana, Illinois, Kentucky, Tennessee, and Mississippi. The Department would therefore cordially invite the coöperation of colleges, scientific institutions, and individual admirers of meteorology in these sections of our country. The directions and forms used in the army, may at any time be obtained by applications addressed to the Surgeon General, U. S. A., Washington. All contributions from other sources will be cheerfully acknowledged in the publications of the Department. Under the direction of the Surgeon General, arrangements have been made for prosecuting meteorological inquiries with renewed diligence, and a medical officer will shortly be detailed to give his undivided time and attention to the subject, to arrange and digest the matter collected, and to prepare the results for publication.

Professor Booth read a communication by Mr. Henry C. Lea, of Philadelphia, entitled, "Description of some New Fossil Shells from the Tertiary of Virginia."

Mr. Lea observes, that the Atlantic tertiary of the United States from the St. Lawrence to Maryland is in patches, and from Maryland to the Gulf of Mexico in one broad sheet. It is considered as belonging near to the eocene, miocene, and post-pliocene periods of Mr. Lyell. Of these, the eocene has no recent species, while the post-pliocene has no extinct ones. The miocene is supposed to have about 17 per cent. of existing species, but Mr. Lea thinks that standard too high. For instance, at Petersburg, Va., there are found 68 species already described, besides 110 which he considers as new; in all 178. Of these, but nine are still existing; which gives us almost exactly five per cent. When we know more of our fossil conchology, the general per centage will most probably be reduced in the same manner. These shells frequently bear a remarkable similarity to those from the miocene of Dax, near Bordeaux, where the per centage of recent shells is between 30 and 40.

The shells described in the paper were obtained through the kindness of M. Tuomey, Esq., of Petersburg. Nearly all of the minuter species were detected by carefully examining a small portion of the marl from the vicinity of that place, as well as the sand scraped from the interior of larger shells, which is a favourite resort with some species. Among them Mr. Lea has found but two forms which appeared to require the erection of new genera.

The following list gives the names of the shells, with their classification, as indicated by Mr. Lea in his paper; the limits of this publication necessarily excluding the full descriptions by which he has characterized them.

FAMILY SERPULIDÆ.

Genus Serpula: S. convoluta, S. anguina.

Genus Petaloconchus (*Nobis*): Descr. Gen. *Testá tubulari, solidá, irregulariter contortâ, laminis longitudinalibus duabus internis.* P. sculpturatus.

FAMILY TUBICOLIDÆ.

Genus Teredo: T. calamus, T. fistula.

Genus Gastrochana: G. ligula.

FAMILY PHOLALIDÆ.

Genus Pholas: P. rhomboidea.

FAMILY SOLENIDÆ.

Genus Solen: S. magnodentatus.

Genus Panopœa: P. dubia.

FAMILY MYIDÆ.

Genus Mya: M. reflexa.

Genus Thracia (*Leach*): T. transversa.

Genus Anatina: A. tellinoides.

FAMILY MACTRIDÆ.

Genus Aligena (*Nobis*): Descr. Gen. *Testâ æquivalvi, subæquilaterali, posticè et anticè clausâ; cardine dente cardinali uno, sulco sub natibus longo, minimè profundo.* A. striata, A. lævis.

Genus Kellia: K. triangula.

FAMILY LITHOPHAGIDÆ.

Genus Saxicava: S. oblonga.

Genus Petricola: P. compressa, P. bullata.

FAMILY NYMPHIDÆ.

Genus Psammocola (*Blainville*): P. leporina, P. lucinoides, P. regia.

Genus Lucina: L. punctulata, L. lens.

FAMILY CONCHIDÆ.

Genus Astate (*Sowerby*): A. lineolata.

Genus Cytherea: C. elevata, C. sphœrica.

Genus Venus: V. ascia.

FAMILY CARDIIDÆ

Genus Hiatella: H. lancea.

FAMILY ARCIDÆ.

Genus Nucula: N. dolabella, N. diaphana, N. æquilatera, N. carinata, N. acutidens.

FAMILY MYTILIDÆ.

Genus Modiola: M. Spinigera.

FAMILY MALLEIDÆ.

Genus Avicula: A. multangulata.

FAMILY PECTENIDÆ.

Genus Pecten: P. micropleura, P. tenuis.

Genus Plicatula: P. rudis.

FAMILY PHYLLIDIDÆ.

Genus Chiton: C. transenna.

Genus Patella: P. acinaces.

FAMILY CALYPTRŒIDÆ.

Genus Cemoria (*Leach*): C. oblonga.

Genus Calyptræa: C. pileolus.

Sub-Genus Infundibulum (*De Montfort*): I. concentricum.

Sub-Genus Crepidula: C. ponderosa, C. cornucopiæ, C. lamina.

FAMILY BALLÆIDÆ.

Genus Bulla: B. cylindrus.

FAMILY MELANIDÆ.

Genus Pasithea (*Lea*): P. exarata, P. subula, P. eburnea, P. lævigata, P. ovulum, P. diaphana, P. turbinopsis, P. ornata.

FAMILY NERITIDÆ.

Genus Natica: N. aperta, N. sphærulus, N. crassilabrum.

FAMILY PLICACIDÆ.

Genus Actæon: A. granulatus, A. globosus, A. turbinatus, A. angulatus, A. glans, A. sculpturatus, A. nitens, A. milium, A. simplex.

Genus Pyramidella: P. suturalis, P. elaborata.

FAMILY SCALARIDÆ.

Genus Scalaria: S. acicula, S. cornigera, S. micropleura.

Genus Delphinula: D. costulata, D. concava, D. lipara, D. obliquè striatâ, D. trochiformis, D. globulus, D. aperta, D. naticoides.

FAMILY TURBINIDÆ.

Genus Rotella: R. sub-conica, R. carinata, R. lenticularis, R. umbellicata.

Genus Trochus: T. armillus, T. conus, T. lens, T. torquatus, T. aratus, T. Ruffinii.

Genus Turbo: T. glaber, T. rusticus.

FAMILY CANALIFERIDÆ.

Genus Cerithium: C. clavulus, C. curtum, C. dædaleum, C. moniliferum.

Genus Pleurotoma: P. lunatum.

Genus Fasciolaria : F. parvula.

Genus Fusus : F. pygmæus, F. anomalus.

FAMILY PURPURIDÆ.

Genus Buccinum : B. Tuomeyi, B. pusillum, B. frumentum, B. quadrulatum.

Genus Nassa : N. impressa.

FAMILY COLUMELIDÆ.

Genus Marginella : M. cornulus, M. exilis.

Genus Oliva : O. canaliculata, O. ancillariæformis.

Professor Henry presented and read a communication "On a New Method of determining the Velocity of Projectiles."

The new method proposed by the author, consists in applying the instantaneous transmission of an electrical action, to determine the time of the passage of the ball between two screens, placed at a short distance from each other, on the path of the projectile. For this purpose, the observer is provided with a revolving cylinder, moved by clock work at the rate of at least ten turns in a second; and of which the convex surface is divided into a hundred equal parts; each part therefore indicating in the revolution the thousandth part of a second. Close to the surface of this cylinder, which revolves horizontally, are placed two galvanometers, one at each extremity of a diameter; the needles of these being furnished at one end with a pen for making a dot with printers' ink on the revolving surface.

To give motion to the needles at the proper moment, each galvanometer is made to form a part of the circuit of a galvanic current, which is completed by a long copper wire passing to one of the screens, and crossing it several times, so as to form a grating, through which the ball cannot pass without breaking the wire, and thus stopping the current. During the continuance of the galvanic action, the marking end of the needle is turned from the revolving cylinder, a few degrees, and pressed immovably against a "steady pin" by the well known deflecting power of the electrical current; but the moment the current is stopped by the breaking of the long conductor, in the passage of the ball through the screen, the marking end of the needle is projected against the cylinder by the action of a fine spiral spring, similar to the hair spring of a watch, coiled around the centre pin which supports the needle, and having an elastic force a little less than the deflecting power of the electrical current. The relative position of the dots thus formed gives the time of the passage of the ball through the space between the screens, and indicates the velocity at this part of the course.

The degree of deflection of the needle can be increased or diminished, by turning a screw, which alters the position of the "steady pin;" and the tension of the spiral spring can also be changed by an arrangement like that of the regulator of a watch.

In order that the position of the dots on the surface of the cylinder may exactly indicate the required interval of time, it is necessary that the time occupied by each needle, in starting from rest and moving across the small arc to strike against the cylinder, should be precisely equal. If this be not the case, then the difference of these times will be the error of the instrument. This must however be exceedingly small, since the whole range of the end of the needle need not be more than the 20th of an inch; and the precise amount of error can readily be determined by experiment.

To adjust the apparatus for use, the galvanometers must be so placed that the two dots may be impressed on the cylinder, diametrically opposite each other when the instrument is at rest. The cylinder being then put in motion, the two circuits of long wire are placed together, so that they can be broken at the same instant by lifting a wire common to both from a cup of mercury. If, after breaking the circuits, the dots are still found in the same relative position, no further adjustment or correction will be required: but if this is not the case, then the springs may be altered until the dots are found in their proper positions; or the difference may be noted, and this constantly applied in each actual experiment as an index error.

To prevent the dot from the first galvanometer being confounded with that from the second, the two instruments are placed one below the other, in different horizontal planes.

In order that the pen may not describe a line on the cylinder, reentering into itself, and thus obliterate the dot first impressed; it may be found necessary to give the cylinder a slow ascending motion, so that a spiral instead of a circle would be marked on its surface. A chronometer for measuring minute portions of time, with a motion of this kind, is described in Young's Natural Philosophy, Vol. I. page 191.

To prevent agitations of the air, the whirling apparatus with the galvanometer may be placed in the vacuum of an air pump; and that part of the conducting wire, which crosses the screen, may be separated at each crossing, the ends being again united by slightly twisting them together, and the conduction being preserved by proper amalgamation, so that the force necessary to break the circuit may not sensibly lessen the velocity of the ball.

[Various other methods may be devised, for impressing a mark on the revolving cylinder, at the moment of the rupture of the galvanic current by the passage of the ball through the screen. But the following, which has suggested itself to Prof. H. since the meeting of the Society, and has been communicated by him to the Reporter, may be regarded as among the best. It dispenses with the galvanometers, and produces the mark by a direct electrical action.

A part of the long wire, which leads to the screen, is coiled around a bundle of soft iron wire; and over this is coiled another long wire; so as to produce an intense secondary current, on the principle of the common coil machine. One extremity of the secondary circuit is connected with the axis of the cylinder, and the other is made to terminate almost in contact with the revolving surface, which in this modification of the instrument is surrounded by a ruled or graduated paper. It is obvious, that the secondary current, which is induced by the interruption of the primary circuit, will pierce or mark the paper band at the moment of the screen being broken. There is no difficulty in effecting such a current of sufficient intensity to mark the paper: since Prof. H. in some of his experiments on Induction has developed one, which gave a spark between a point and a surface, of nearly a fourth of an inch in length.

The terminal points of the wires from the two screens may be placed very near each other in the same horizontal plane: if then the cylinder, revolving horizontally, has at the same time a slow ascending motion, the relative position of the dots on the paper will give the number of whole turns and parts of a turn, made by the cylinder while the ball was passing between the two screens. In the same way, the terminal points of wires from a number of different pairs of screens may be made to impress their marks on the surface of the same cylinder, and the velocity of the ball at the different points of its path may in this way be determined by a single experiment.

REPORTER.]

Mr. Kane read a letter, addressed to him by George Bancroft, Esq., dated Boston, 22d May, 1843, expressing his regrets at being absent from the Society's meeting, and communicating the following extracts from unpublished letters of Dr. Franklin:—

Benjamin Franklin to Cadwallader Colden.

Philadelphia, Feb. 13*th*, 1749–50.

Sir,—I received your very kind letter, relating to my proposals for the education of our youth, and return you the thanks of the gentlemen concerned, for the useful hints you have favoured us with. It was long doubtful, whether the academy would be fixed in the town or country; but a majority of those, from whose generous subscriptions we expected to be able to carry the scheme into execution, being strongly for the town, it was at last fixed to be there. And we have, for the purpose, made an advantageous purchase of the building which was erected for itinerant preaching: a house one hundred feet long, and seventy wide, with a large lot of ground, capable of additional buildings, situate in an airy part of the town. It cost, I suppose, not less than £2000 building: but we have it for less than half the money. It is strongly built of brick; and we are now about dividing it into rooms for the academy. The subscription goes on with great success, and will not, I believe, be much short of £5000, besides what we expect from the proprietors. From our government we expect nothing. Enclosed I send you a copy of our present constitutions; but we are to have a charter, and then such of the constitutions as are found good by experience will, I suppose, be enacted into laws, and others amended, &c.

In this affair, as well as in other public affairs I have been engaged in, the labouring oar has lain and does lie very much upon me.

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I have no observations of Jupiter's satellites to send you, as I expected I should have. Being myself otherwise engaged, and not very skilful in those matters, I depended on our astronomer, Mr. Godfrey, and put the telescope into his hands for that purpose. He had a fine summer for it, but * * * * * * * * our surveyor general Mr. Scull, who was his neighbour, could never get him to assist in making the meridian line. He is now dead, and your letter of directions for making such a line, which I put into his hands, is lost. Mr. Scull desires me to write to you for a repetition of those directions, and when you have a little leisure I shall be obliged to you for them; but it will now be midsummer, before we shall have an opportunity of observing Jupiter again.

I have wrote some additional papers on electricity, which I will get copied and send to you per next post. They go on much slower in those discoveries at home, than might be expected.

I am glad you are about enlarging and explaining your principles of natural philosophy. I believe the work will be well received by the learned world.

Benjamin Franklin to Cadwallader Colden.

Philadelphia, Feb. 28th, 1753.

* * * * We are preparing here to make accurate observations on the approaching transit of Mercury over the sun. You will oblige us much by sending the accounts you have received from Lord Macclesfield of his great mural quadrant. I congratulate you on your discovery of a new motion in the earth's axis. You will, I see, render your name immortal.

I believe I have not before told you, that I have provided a subscription here of £1500, to fit out a vessel in search of a north-west passage: she sails in a few days, and is called the Argus, commanded by Mr. Swaine, who was in the last expedition in the Calefornia, author of a journal of that voyage, in two volumes. We think the attempt laudable, whatever may be the success. If he fails, *magnis tamen excidit ausis.*

Mr. Thomas Gilpin laid before the meeting some fine specimens of the Bombax of Santa Cruz.

SPECIAL MEETING.

Eighth Session, 30th May, half past 5 o'clock, P. M.

Dr. Patterson, Vice-President, in the Chair.

Mr. Ellwood Morris made an oral communication relative to the Turbine of Fourneyron, a horizontal hydraulic motor first employed in France in 1827, and of late successfully introduced into use in our country by Merrick & Towne of Philadelphia.

Mr. Morris traced the history of this machine from the first suggestion of Belidor, supported by M. Navier. He adverted to the prize of 6000 francs, offered in 1827, 1829, and 1832, by the Society for encouraging national industry, to the person who should successfully project and put in use two hydraulic motors, which should